5. *Younger Cenozoic Reef-corals from the Nabire Beds of Nabire, Dutch New Guinea.*

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(Comm. by H. YABE, M.I.A., Jan. 12, 1942.)

The Cenozoic reef-corals from New Guinea have hitherto been but little known. Of only three works on the subject now accessible to us one is by J. Felix,[1] the other by T. W. Gregory and J. S. Trench,[2] and the last by Gregory.[3] Felix, who dealt with the fossil reef-corals found in the Mamberamo valley which begins in the northern slope of Van Rees Mountains, in Dutch Central New Guinea, was able to discriminate from his material 25 species of reef-corals, covering 11 genera; excepting 3 species, all the other specifically identified forms belong to living types, and this fauna was considered by him to be of Pliocene age. Gregory and Trench reported a coral fauna of Eocene age found in rolled limestone pebbles on the river bed of the Fly river, in British New Guinea, comprising 15 species of corals, all extinct, distributed over 11 genera, several of which are typically Eocene. Later, Gregory added to this list another species which belongs to *Octotremacis* (=*Polytremacis*); to this characteristic genus we have already referred in another paper.[4] Fossil corals are reported also from a number of Miocene rocks that widely extend throughout the island, although details of them are not yet known.

On a recent visit to Dutch New Guinea, Mr. R. Tayama,[5] geologist of the South Sea Department, collected numerous specimens of reef-corals from greenish-gray marly rocks exposed at ten localities along the Boemi and Nabaroewa rivers, both emptying into the head of Geelvink Bay; all the fossiliferous deposits belong to his Nabire Beds.

While some of the samples of fossil reef-corals collected by Tayama are well preserved, others are fragmental, with their minute structure so obliterated as to render specific identification almost hopeless. The species discriminated from his material are listed below.

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1) J. Felix: Über eine Pliocene Korallenfauna aus Holländisch Neu-Guinea. Ber. Verh. d. k. sächs. Gesell. Wiss. mat.-phys. Kl., Bd. 64, pp. 429–445, 1912.

2) J. W. Gregory and J. B. Trench: Eocene Corals from the Fly River, Central New Guinea. Geol. Mag. London, N. S. Dec. 6, Vol. 3, No. 11, pp. 481–488, No. 12, pp. 529–536, 1916.

3) J. W. Gregory: *Octotremacis*, Its Structure, Affinities, and Age. Geol. Mag. London, N. S. Dec. 6, Vol. 4, No. 1, pp. 9–12, 1917.

4) H. Yabe and T. Sugiyama: *Cebuphyllia chitanii*, gen. et sp. nov., a New Fossil Astreoporoid Coral from Cebu, Philippine Islands. Proc. **17** (1941), 421–424.

5) The geographical and geological notes by Mr. Tayama are to be published in the Contributions from the Institute of Geology and Palaeontology, Tôhoku Imperial University, in Japanese Language, No. 37.

Species \ Localities	7′	10	26	50	52	58	63	85	96	99
Seriatopora cf. *straeleni* Thiel	—	—	—	—	—	—	—	—	—	×
Seriatopora sp.	—	—	—	—	—	×	—	—	—	—
Stylophora pistillata (Esper)	—	—	—	—	—	—	×	—	—	—
Stylophora sp.	—	—	—	×	—	—	—	—	—	—
Caulastraea sp.	—	—	—	—	×	—	—	—	—	—
Cyphastrea chalcidicum (Forskål)	—	—	×	—	—	—	—	—	—	—
Cyphastrea microphthalma (Lamarck)	×	—	—	—	—	—	—	—	—	—
Leptastrea purpurea (Dana)	×	—	—	—	—	—	—	—	—	—
Leptastrea transversa Klunzinger	×	—	—	—	—	—	—	—	—	—
Leptastrea ? sp.	—	—	—	—	—	—	—	—	—	×
**Anisocoenia* sp. nov. ?	—	—	×	—	—	—	—	—	—	—
Montastraea curta (Dana)	×	—	—	—	—	—	—	—	—	—
Favia speciosa (Dana)	×	—	—	—	—	—	—	—	—	—
Favites virens (Dana)	×	—	—	—	—	—	—	—	—	—
Favites ? sp.	—	—	—	—	—	—	—	—	—	×
Goniastrea sp.	—	—	×	—	—	—	—	—	—	—
Coeloria astreiformis (M. Edw. et H.)	—	—	—	—	—	—	—	—	×	—
Coeloria lamellina (Esper)	—	×	—	—	—	—	—	—	—	—
Coeloria sp.	×	—	—	—	—	—	—	—	—	—
Platygyra phrygia (Ell. et Sol.)	—	—	—	—	—	—	—	—	—	×
Platygyra gracilis (Dana)	×	—	—	—	—	—	—	—	—	—
Oulophyllia sp.	—	—	—	—	—	—	×	—	—	—
Echinopora cf. *lamellosa* (Esper)	—	—	—	—	—	—	—	—	×	—
Echinopora sp.	—	—	—	—	—	—	×	—	—	—
Symphyllia sp.	—	—	—	—	—	—	×	—	—	—
Lobophyllia hemprichi (Ehr.)	—	—	—	—	—	—	×	—	—	—
Oxyphyllia sp.	—	—	—	—	—	—	×	—	—	—
Coeloseris mayeri Vaughan	—	—	×	—	—	—	—	—	—	—
Pachyseris speciosa (Dana)	—	—	—	—	×	—	—	—	—	—
Pachyseris sp.	—	×	—	—	—	—	—	—	—	—
Pavona maldivensis (Gardiner)	—	—	—	—	—	—	—	×	—	—
Pavona micromata Felix	—	×	—	—	—	—	—	—	—	—
Polyastrea palmata (Dana)	—	—	×	—	—	—	—	—	—	—
**Cyathoseris* (?) *tayamai* sp. nov.	—	—	—	—	—	—	—	—	×	—
Fungia cf. *patella* (Ell. et Sol.)	—	—	—	—	—	—	—	—	×	—
Fungia sp. (a)	—	—	×	—	—	—	—	—	—	—
Fungia sp. (b)	—	—	—	×	—	—	—	—	—	—
Fungia sp. (c)	—	—	—	×	—	—	—	—	—	—
Turbinaria peltata (Esper)	—	—	—	—	—	—	×	—	—	—
Turbinaria sp.	—	—	—	—	—	—	×	—	—	—
Montipora sp.	—	—	—	—	×	—	—	—	—	—
Acropora sp. (a)	—	×	—	—	—	—	—	—	—	—
Acropora sp. (b)	—	×	—	—	—	—	—	—	—	—
Acropora sp. (c)	—	—	—	—	—	—	—	—	×	—
Acropora sp. (d)	—	—	—	—	×	—	—	—	—	—
Porites sp. (a)	×	—	—	—	—	—	—	—	—	—

Species \ Localities	7′	10	26	50	52	58	63	85	96	99
Porites sp. (b)	×	—	—	—	—	—	—	—	—	—
Porites sp. (c)	×	—	—	—	—	—	—	—	—	—
Porites sp. (d)	—	—	—	—	—	—	—	—	×	—
Porites sp. (e)	—	—	—	—	—	—	—	—	×	—
Porites sp. (f)	—	—	×	—	—	—	—	—	—	—
Porites sp. (g)	—	—	×	—	—	—	—	—	—	—
Porites sp. (h)	—	—	×	—	—	—	—	—	—	—
Porites sp. (i)	—	—	—	×	—	—	—	—	—	—
Porites sp. (j)	—	—	—	—	—	×	—	—	—	—
Porites sp. (k)	—	—	—	—	—	×	—	—	—	—

Localities: 7′, bank of the Papaja, a tributary of the Boemi river; 10, between the Papaja and Boemi rivers; 26, south of Nabire; 50, bank of the Patina, a tributary of the Boemi; 52, lower Patina river; 58, lower Semi river, a tributary of the Boemi; 63, near Airjdat on the middle Boemi; 85, junction of the Papaja and the Boemi; 96 lower Nabaroewo river; 99, upper Nabaroewo river.

Of the total 56 species, distributed over 27 genera, 22 species are identified with or are at least almost indistinguishable from those now living in the coral seas of the Pacific, while the remainder are specifically indeterminable, and excepting 2 species, belong to genera represented in the present reef-coral fauna. Only the two, starred in the above list, out of a total of 56 species belong to extinct genera or to genera not yet known to be living, the ratio of extinct forms to the total specifically identified being 0.87%.

The most dominant generic type in the fossil corals at hand is *Porites*, which is represented by as many as 11 species, followed by *Acropora* and *Fungia*, each with 4 species. The dominance of *Porites* and *Acropora* point to the geologically young age of the coral fauna.

The coral fauna of Mamberamo studied by Felix has 13 genera and 1 species that are common to our's, the common genera being *Stylophora*, *Montastraea*, *Favia*, *Favites*, *Goniastrea*, *Coeloria*, *Echinopora*, *Oxyphyllia* (=*Echinophyllia*), *Symphyllia*, *Pavona*, *Fungia*, *Porites*, and *Acropora*, and the common species being *Pavona micrommmata* Felix (=*Stephanocoenia interseptata* Esper). The scarcity of species common to the two faunas is not of much significance, first, because the number of species identified is small in both faunas, being 23 in our's and 14 in the Mamberamo fauna; second, because we have no species common even to two out of the ten localities of Tayama. As to the latter, it is no doubt due to the great haste in which Tayama made his journey, without sufficient time to make as good a collection as he would have wished. Future careful and energetic collecting in the two districts should certainly increase the number of common species.

According to Felix, the Mamberamo fauna has 3 extinct species, *Goniopora affinis* (Reuss), *Goniaraea anomala* (Reuss), and *Coeloria singularis* (Mart.), the ratio of extinct species to the total of those specifically determined being 2.1%. On the other hand, the same ratio

is 0.83% in our's, hence much less than in the former. Although our fauna may possibly be younger, it certainly can not be older than the Mamberamo fauna, which Felix assigned to the Pliocene, provided of course that our corals come from one and the same formation, as Tayama believed. It may be stated in this connection, that in his study of the river- and coastal terraces of the Nabire district, Tayama had assigned the Nabire Beds containing the fossil reef-corals, to Plio-Pleistocene age.

Of the two extinct species in our material, one is referred with doubt to *Cyathoseris* and the other to *Anisocoenia*. The former genus ranges from Eocene to Miocene, representing a type of coral that flourished most during the Palaeogene. The latter, which ranges from the Miocene to Plio-Pleistocene, had its maximum development in the Miocene. *Cyathoseris* (?) *tayamai*, now to be described, comes from Tayama's locality No. 96, in association with *Coeloria astreiformis* (M. Edw. et H.), *Echinopora* cf. *lamellosa* (Esper), *Fungia* cf. *patella* (Ell. et Sol.), *Acropora* sp., *Porites* spp. (d, e); while *Anisocoenia* sp. nov. (?), to be described on another occassion, is from his locality No. 26, found in association with *Cyphastrea chalcidicum* (Forskål), *Goniastrea* sp., *Coeloseris mayeri* Vaughan, *Fungia* sp., *Polyastrea palmata* (Dana), and *Porites* spp., (f, g, h). The contemporaneity of the marly rock with corals of the two localities and those of other Tayama's localities is likely to be questioned, unless confirmed in the meantime.

Cyathoseris M. Edwards et J. Haime, 1849

Cyathoseris M. Edwards et J. Haime: Compt. rend. de l'Acad. des sc., XXXIX, p. 72, 1849.

Cyathoseris M. Edwards et J. Haime: British Fossil Corals, Introduction. Pal. Soc. Mon., p. XLIX, 1850.

Cyathoseris P. M. Duncan: Revision of the Genera of the Madreparaia. Jour. Linn. Soc. London, p. 406, 1883.

Cyathoseris P. Oppenheim: Die Anthozoen der Gosauschichten in den Ostalpen. Pp. 240-242, 1930.

Genotype: *Pavonia infundibuliformis* Blainville, Eocene.

An apparently extinct genus, Eocene to Miocene in geological range; there is no valid Cretaceous species of this genus according to P. Oppenheim.

Cyathoseris (?) *tayamai*, sp. nov.

Figs. 1–4

A single fragment of a probably explanate colony at hand is sufficiently well preserved for specific description.

Foliaceous, 57 mm broad and 5 mm thick in proximal part, gradually thinning outwards, sinuous at margin, on the whole flat, but folded, forming norrow radial collines on the upper surface of corallum and strong depressed striae or narrow linear grooves on under surface. Collines variably high and broad, 2–4 mm, rarely up to 10 mm high, 2–3 mm broad at base, and keeled at top, also fairly variable in height

and breadth even in one and the same colline; a number of lateral collines 10–15 mm long, arranged pinnately on both sides of the median coline 25 mm long; valleys between collines 3–5 mm, rarely up to 19 mm broad, nearly flat at bottom. Calices 2 mm wide, confined to the upper surface of corallum, always lying in valleys and arranged in more or less concentrical rows; 1–4 of them counted on a row traversing each valley; not well defined, being confluent with adjacent ones connected by septocostae and only indicated by narrow columella, radially surrounded by slightly elevated septocostae, which elsewhere run parallel to each other and are normal to the collines. Septa or septocostae hexameral, very variable in number, ranging from 12 to 34, usually 26–34 counted in full grown calices, where last cycle is incomplete; subequal in thickness and height, both reduced successively in those of younger cycles; 6 septa of first cycle which are most exsert, and some of the six septa of second cycle almost reaching the center of calice; all finely crenulated along free margin and minutely granulated on lateral sides; quite uniform in length and height where they run up the collines to meet those of the opposite side, on often keeled top. Columella minute, papillary, rather deep-seated. Under surface of corallum narrowly grooved opposite collines of upper surface, in marginal part uniformly ornamented with numerous crowded, raised radial striae, which proximally resolve into extremely minute granules. Synapticulae well developed.

Remarks: It is evident from the above description and accompanying photographs that the fossil coral in question stands close to certain forms of the genus *Cyathoseris*, which has now some dozen species, mostly from the Palaeogene, and a few from the Miocene.[1] Generally speaking, the corallum is trochoid in the Palaeogene species and rather explanate in the geologically younger ones. Although the stratigraphical value of such a difference in growth-mode of the corallum in reef-corals is questionable, the present fossil seems to have possessed an explanate corallum in common with the geologically younger forms.

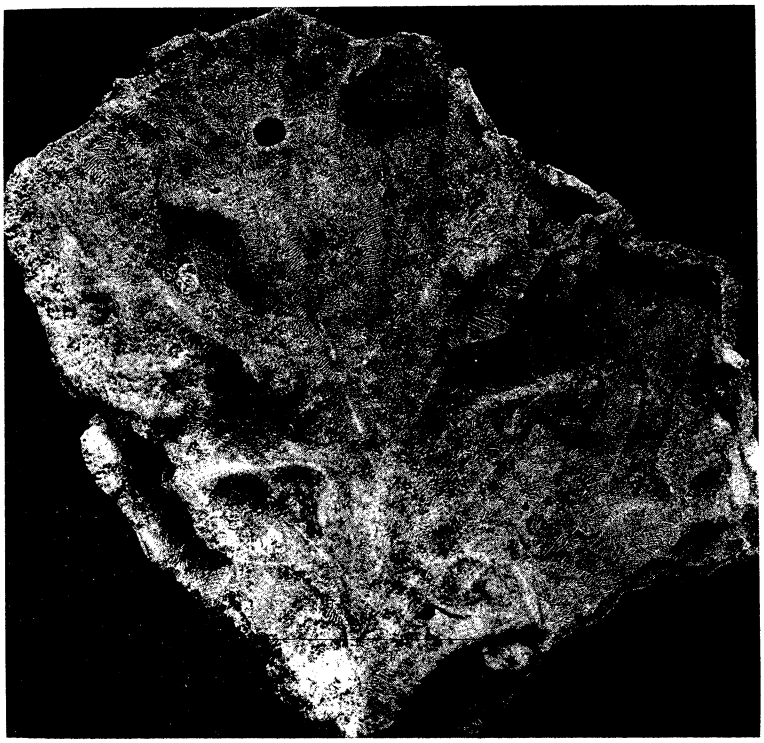
The outstanding features of the present fossil are (1) the calices of very small size, (2) the septa which are slender and provided with minute crenulations along their free margin, and (3) the under surface of the corallum, which is radially striated on the marginal part and radially granulated on the inner.

There is no recorded species of *Cyathoseris* with such a delicate structure as that of our specimen. The closest resemblance to it is *Cyathoseris crassilamellata* Gerth,[2] from the Miocene of Borneo, although even this species differs from it by being of much stouter build.

The specific name of the present fossil is dedicated to Mr. R. Tayama, to whom we owe this and a number of other interesting

1) J. Felix: Fossilium Catalogus. I, Animalia, pars 28: Anthozoa Eocaenica et Oligocaenica, pp. 122–125, 1925. Ditto, pars 35: Anthozoa Miocaenica, pp. 363–364, 1927.

2) H. Gerth: Die Anthozoenfauna des Jungtertiärs von Borneo. Sam. Geol. Reichs-Mus. Leiden, Ser. I, Vol. X, p. 104, pl. 8, fig. 7, 1923.



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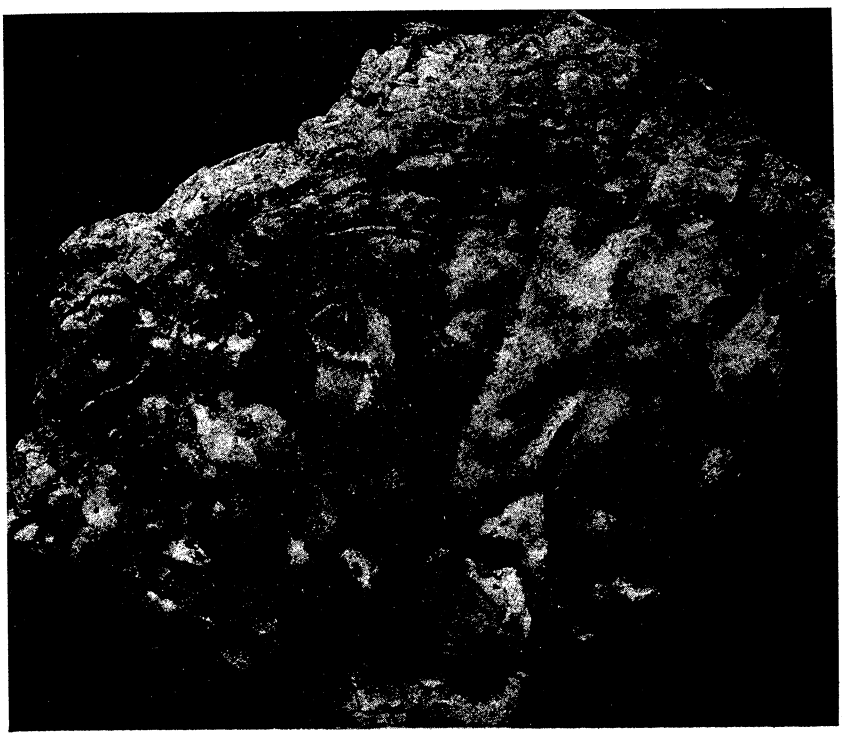

2

3

samples from distant New Guinea. The type specimen is stored in the Institute of Geology and Palaeontology, Tôhoku Imperial University, Sendai (Reg. No. 64558).

Locality: Tayama's locality No. 96 on the lower Nabaroewo river, Nabire district, Dutch New Guinea.

Geological formation and age: Nabire Beds of Tayama, probably Plio-Pleistocene.

Explanation of Figures.

Cyathoseris (?) *tayamai* Yabe and Sugiyama from the Plio-Pleistocene (?) of Dutch New Guinea.

Figs. 1 and 2, the upper and under surface of the corallum, enlarged twice.

Figs. 3 and 4, each a part of Fig. 1 and Fig. 2, greatly enlarged.